

WHAT IS CLAIMED IS:

1. A polarization method of a multi-layered piezoelectric body in which a plurality of piezoelectric layers and a plurality of internal electrodes are alternately laminated and adjacent piezoelectric layers are polarized in the thickness direction thereof such that the polarization directions thereof are in opposite directions; comprising steps of:

a first polarization process in which an electric field in a first thickness direction is applied to the multi-layered piezoelectric body and the polarization is uniformly performed in the first thickness direction,

a secondary polarization process in which an electric field in a second thickness direction that is opposite to the first thickness direction is applied to the piezoelectric layers of both sides of the internal electrodes and the direction of polarization of the piezoelectric layer on only one side of the internal electrode is reversed;

wherein the secondary polarization process is performed in a range such that a remaining polarization degree Pr_2 that exists after the secondary polarization process in the piezoelectric layer having a direction of polarization that is reversed does not exceed a remaining polarization degree Pr_1 after the first polarization.

2. A polarization method of a multi-layered piezoelectric body according to claim 1, wherein the above first polarization process comprises:

a first process in which an electric field in the first thickness direction is applied to the multi-layered piezoelectric body, and

a second process in which an electric field in the second thickness is applied to the multi-layered piezoelectric body, and

wherein the direction of polarization of the multi-layered piezoelectric body produced by the first process is uniformly reversed by the second process.

3. A polarization method of the multi-layered piezoelectric body according to claim 1, wherein the first polarization is performed on a block-like multi-layered piezoelectric body and the secondary polarization process is performed on a substantially rectangular-shaped multi-layered piezoelectric body produced by cutting the block-like multi-layered piezoelectric body in a vertical direction substantially parallel to the internal electrodes.

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4. A polarization method of the multi-layered piezoelectric body according to claim 1, wherein the electric fields applied to the multi-layered piezoelectric body are DC electric fields.

5. A polarization method of the multi-layered piezoelectric body according to claim 1, wherein the polarization degree distribution produced by the first polarization process has a concave shape, and the polarization degree distribution produced by the second polarization process has a flat or convex shape, such that the overall polarization degree distribution of the multi-layered piezoelectric body is uniform.

6. A polarization method of the multi-layered piezoelectric body according to claim 1, wherein the remaining polarization degree Pr2 and the remaining polarization degree Pr1 are approximately equal.

7. A polarization method of the multi-layered piezoelectric body according to claim 1, wherein the remaining polarization degree Pr2 is about 50 kHz.

8. A polarization method of the multi-layered piezoelectric body according to claim 6, wherein the remaining polarization degree Pr1 and the remaining polarization degree Pr2 are about 50kHz.

9. A polarization method of the multi-layered piezoelectric body according to claim 1, wherein the voltage of the electric field applied in the second polarization process is in the range of about 900v to about 1000v.

10. A polarization method of the multi-layered piezoelectric body according to claim 1, wherein the multi-layered piezoelectric body is made of PZT-type piezoelectric ceramic.

11. A polarization method of a multi-layered piezoelectric body in which a plurality of piezoelectric layers and a plurality of internal electrodes are alternately laminated and a polarization is performed on adjacent piezoelectric layers in the thickness direction such that the polarization directions thereof are

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in opposite directions, comprising:

a first polarization process in which electric fields in opposite directions are applied to the piezoelectric layers on both sides of the internal electrodes such that the piezoelectric layers on both sides of internal electrodes are polarized in opposite directions, and

a secondary polarization process in which electric fields in the opposite directions to the electric fields in the first polarization process are applied to the piezoelectric layers of both sides of the internal electrode such that the polarization axes of the piezoelectric layers of both sides of the internal electrode are reversed, wherein

the secondary polarization process is performed in a range such that a remaining polarization degree Pr_2 that exists after the secondary polarization in the piezoelectric layers having a direction of polarization that is reversed does not exceed the remaining polarization degree Pr_1 that exists after the first polarization.

12. A polarization method of the multi-layered piezoelectric body according to claim 11, wherein the first polarization is performed on a block-like multi-layered piezoelectric body and the secondary polarization process is performed on a substantially rectangular-shaped multi-layered piezoelectric body produced by cutting the block-like multi-layered piezoelectric body in a vertical direction substantially parallel to the internal electrodes.

13. A polarization method of the multi-layered piezoelectric body according to claim 11, wherein the electric fields applied to the multi-layered piezoelectric body are DC electric fields.

14. A polarization method of the multi-layered piezoelectric body according to claim 11, wherein the polarization degree distribution produced by the first polarization process has a concave shape, and the polarization degree distribution produced by the second polarization process has a flat or convex shape, such that the overall polarization degree distribution of the multi-layered piezoelectric body is uniform.

15. A polarization method of the multi-layered piezoelectric body according to claim 11, wherein the remaining polarization degree Pr_2 and the

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remaining polarization degree Pr_1 are approximately equal.

16. A polarization method of the multi-layered piezoelectric body according to claim 11, wherein the remaining polarization degree Pr_2 is about 50 kHz.

17. A polarization method of the multi-layered piezoelectric body according to claim 15, wherein the remaining polarization degree Pr_1 and the remaining polarization degree Pr_2 are about 50kHz.

18. A polarization method of the multi-layered piezoelectric body according to claim 11, wherein the voltage of the electric field applied in the second polarization process is in the range of about 900v to about 1000v.

19. A polarization method of the multi-layered piezoelectric body according to claim 11, wherein the multi-layered piezoelectric body is made of PZT-type piezoelectric ceramic.

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